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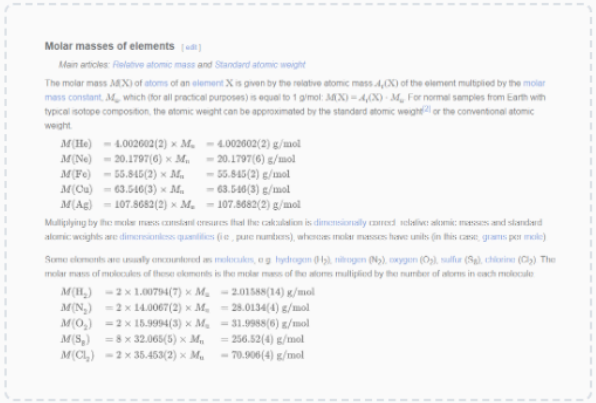

Molar masses of elements [edit]

Main articles: Relative atomic mass and Standard atomic weight

The molar mass $M(X)$ of atoms of an element X is given by the relative atomic mass $A_r(X)$ of the element multiplied by the molar mass constant, M_u, which (for all practical purposes) is equal to 1 g/mol: $M(X) = A_r(X) \cdot M_u$. For normal samples from Earth with typical isotope composition, the atomic weight can be approximated by the standard atomic weight[2] or the conventional atomic weight.

$M(\mathrm{He}) = 4.002602(2) \times M_u = 4.002602(2)\ \mathrm{g/mol}$
$M(\mathrm{Ne}) = 20.1797(6) \times M_u = 20.1797(6)\ \mathrm{g/mol}$
$M(\mathrm{Fe}) = 55.845(2) \times M_u = 55.845(2)\ \mathrm{g/mol}$
$M(\mathrm{Cu}) = 63.546(3) \times M_u = 63.546(3)\ \mathrm{g/mol}$
$M(\mathrm{Ag}) = 107.8682(2) \times M_u = 107.8682(2)\ \mathrm{g/mol}$

Multiplying by the molar mass constant ensures that the calculation is dimensionally correct: relative atomic masses and standard atomic weights are dimensionless quantities (i.e., pure numbers), whereas molar masses have units (in this case, grams per mole).

Some elements are usually encountered as molecules, e.g. hydrogen (H_2), nitrogen (N_2), oxygen (O_2), sulfur (S_8), chlorine (Cl_2). The molar mass of molecules of these elements is the molar mass of the atoms multiplied by the number of atoms in each molecule:

$M(\mathrm{H_2}) = 2 \times 1.00794(7) \times M_u = 2.01588(14)\ \mathrm{g/mol}$
$M(\mathrm{N_2}) = 2 \times 14.0067(2) \times M_u = 28.0134(4)\ \mathrm{g/mol}$
$M(\mathrm{O_2}) = 2 \times 15.9994(3) \times M_u = 31.9988(6)\ \mathrm{g/mol}$
$M(\mathrm{S_8}) = 8 \times 32.065(5) \times M_u = 256.52(4)\ \mathrm{g/mol}$
$M(\mathrm{Cl_2}) = 2 \times 35.453(2) \times M_u = 70.906(4)\ \mathrm{g/mol}$

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Code | Preview

```
\usepackage{hyperref}
\hypersetup{pdfauthor={}, pdftitle={Molar masses of elements},
\setlength{\parindent}{0pt}

\begin{document}

\section*{Molar masses of elements \normalsize\normalfont\textc

\textit{Main articles:} \href{https://en.wikipedia.org/wiki/Rel

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The molar mass $M(\mathrm{X})$ of atoms of an \href{https://en.

\begin{align*}
M(\mathrm{He}) &= 4.002602(2) \times M_{\mathrm{u}} = 4.002602(
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\end{align*}

Multiplying by the molar mass constant ensures that the calcula

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Molar masses of compounds [edit]

Main article: Molecular mass § Calculation

The molar mass $M(\mathrm{X})$ of a compound is given by the sum of the relative atomic masses $A_\mathrm{r}(\mathrm{X}_i)$ of the elements (each multiplied by the number of atoms n_i per element) which form the compound multiplied by the molar mass constant, $M_\mathrm{u} \approx 1$ g/mol:

$$M(\mathrm{X}) = M_\mathrm{r}(\mathrm{X}) \cdot M_\mathrm{u} = M_\mathrm{u} \sum_i n_i A_\mathrm{r}(\mathrm{X}_i).$$

Here, $M_\mathrm{r}(\mathrm{X})$ is the relative molar mass, also called molecular weight or formula weight. For normal samples from Earth with typical isotope composition, the standard atomic weight or the conventional atomic weight can be used as an approximation of the relative atomic mass of the sample. Examples are:

$$\begin{aligned} M(\mathrm{NaCl}) &= [22.98976928(2) + 35.453(2)] \times M_\mathrm{u} \\ &= 58.443(2)\ \mathrm{g/mol} \\ M(\mathrm{C_{12}H_{22}O_{11}}) &= [12 \times 12.0107(8) + 22 \times 1.00794(7) + 11 \times 15.9994(3)] \times M_\mathrm{u} \\ &= 342.297(14)\ \mathrm{g/mol} \end{aligned}$$

Average molar mass of mixtures [edit]

An average molar mass may be defined for mixtures of substances.[1] This is particularly important in polymer science, where there is usually a molar mass distribution of non-uniform polymers so that different polymer molecules contain different numbers of monomer units.[3][4] The average molar mass of mixtures $\overline{M}$ can be calculated from the mole fractions x_i of the components and their molar masses M_i:

$$\overline{M} = \sum_i x_i M_i.$$

It can also be calculated from the mass fractions w_i of the components:

$$\frac{1}{\overline{M}} = \sum_i \frac{w_i}{M_i}.$$

As an example, the average molar mass of dry air is 28.9647 g/mol.[5]

Molar masses of elements [edit]

Main articles: Relative atomic mass and Standard atomic weight

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\end{aligned}$$

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Moles and Molar Mass

0.5/1.0 point (ungraded)

Avogadro's number: $\mathrm{N_A} = 6.02214 \times 10^{23}$.

Element	Average Atomic Mass
sulfur, S	$32.0650\ \frac{\mathrm{g}}{\mathrm{mol}}$
potassium, K	$39.0983\ \frac{\mathrm{g}}{\mathrm{mol}}$

How many moles are in 71.7 grams of potassium sulfide, $\mathrm{K_2S}$?

0.6502717174 mol ✱

0.6502717174

Your value is correct, but your answer does not have the correct number of significant digits.

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The Laws of Definite and Multiple Proportions

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Ask Gemini

Action required

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✱ Partially correct (0.5/1 point)

The Laws of Definite and Multiple Proportions

0.5/1.0 point (ungraded)

Calculate the percent by mass of hydrogen in acetic acid, $(C_2H_4O_2)$, using the molar masses given below. Express the answer to four significant figures.

The molar mass of acetic acid is $60.05\ \frac{g}{mol}$.

The molar mass of hydrogen, $1.0079\ \frac{g}{mol}$.

6.714 %

6.714

Your value is correct, but your answer does not have the correct number of significant digits.

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✱ Partially correct (0.5/1 point)

If after taking this Pre-Test you feel that you need to study this material, please complete the sub-module entitled "Classifications of Matter."

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0.6502717174

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✱ Partially correct (0.5/1 point)

The Laws of Definite and Multiple Proportions

1.0/1.0 point (ungraded)

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Fresh Copper	Early Oxidation	Dark Brown Copper	Patina Formation Begins	Mostly Green Patina	Fully Developed Patina